

We claim as our invention:

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1. A combustion turbine system comprising:  
a compressor for compressing air for combustion;  
a combustor connected to said compressor for receiving compressed air from said compressor and for receiving fuel with said compressed air and said fuel being combusted therein and producing a combustion gas;  
a turbine connected to said combustor and arranged to receive said combustion gas for driving said turbine with said combustion gas being exhausted from said turbine; and  
a fuel line connected to a source of said fuel and connected to said combustor with a portion of said fuel line being disposed in heat transfer relationship with said combustion gas thereby heating said fuel prior to being introduced into said combustor.
  2. The combustor turbine system according to claim 1 wherein said portion of said fuel line is disposed in heat transfer relationship with said combustion gas which has been exhausted from said turbine.
  3. The combustion turbine system according to claim 2 wherein said portion of said fuel line is disposed in heat transfer relationship with said combustion gas downstream of said turbine.
  4. The combustion turbine system according to claim 3 wherein said system further comprises an exhaust stack connected to said turbine for exhausting said combustion gas to the atmosphere.
  5. The combustion turbine system according to claim 4 wherein said portion of said fuel line is disposed in said exhaust stack and in heat transfer relationship with said combustion gas.
  6. The combustion turbine system according to claim 5 wherein said system further includes a by-pass fuel system for directing unheated fuel to said combustor.

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7. The combustion turbine system according to claim 6 wherein said by-pass fuel system comprises a by-pass fuel line connected to a source of said fuel and connected to said combustor for delivering unheated fuel to said combustor.

8. The combustion turbine system according to claim 7 wherein said by-pass fuel system further comprises control means connected to said fuel line for controlling the amount of said heated fuel and the amount of said unheated fuel being delivered to said combustor.

9. The combustion turbine system according to claim 8 wherein said control means comprises:

control valve means disposed in said by-pass fuel line for varying the amount of fuel passing therethrough; and

temperature controller means electrically connected to said fuel line downstream of said by-pass fuel line and electrically connected to said control valve means for sensing the temperature of said fuel entering said combustor and for adjusting the flow of said unheated fuel in said by-pass fuel line.

10. The combustion turbine system according to claim 9 wherein said portion of said fuel line is disposed in a by-pass channel of said exhaust stack.

11. The combustion turbine system according to claim 10 wherein said by-pass channel has a damper disposed therein for controlling the flow of said combustion gas therethrough.

12. The combustion turbine system according to claim 11 wherein said control valve means comprises a globe valve.

13. The combustion turbine system according to claim 12 wherein said temperature controller means comprises a digital positioner.

14. The combustion turbine system according to claim 3 wherein said combustion turbine system further includes a by-pass fuel system for directing unheated fuel to said combustor.

15. The combustion turbine system according to claim 14 wherein said by-pass fuel system comprises a by-pass fuel line connected to a source of said fuel and connected to said combustor for delivering unheated fuel to said combustor.

16. The combustion turbine system according to claim 15 wherein said by-pass fuel system further comprises control means connected to said fuel line for controlling the amount of

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said heated fuel and the amount of said unheated fuel being delivered to said combustor.

17. The combustion turbine system according to claim 16 wherein said control means comprises:

control valve means disposed in said by-pass fuel line for varying the amount of fuel passing there-through; and

temperature controller means electrically connected to said fuel line downstream of said by-pass fuel line and electrically connected to said control valve means for sensing the temperature of said fuel entering said combustor and for adjusting the flow of said unheated fuel in said by-pass fuel line.

18. The combustion turbine system according to claim 17 wherein said combustion turbine system further comprises a heat recovery steam generator located downstream of said turbine with said combustion gas flowing there-through, and with said portion of said fuel line being disposed in said heat recovery steam generator and in heat transfer relationship with said combustion gas.

19. The combustion turbine system according to claim 18 wherein said heat recovery steam generator comprises a by-pass passage wherein said portion of said fuel line is disposed in the path of said combustion gas.

20. The combustion turbine system according to claim 19 wherein said heat recovery steam generator further comprises a valve disposed in said by-pass passage for controlling the flow of combustion gas there-through.

21. A method of operating a combustion turbine system comprising:

combusting air and fuel thereby generating a combustion gas;

directing said combustion gas through a turbine for driving said turbine;

exhausting said combustion gas from said turbine, and directing said combustion gas in heat transfer relationship with a portion of a fuel line thereby heating said fuel therein; and

conducting said heated fuel into said combustor.

22. The method according to claim 21 wherein said method further comprises mixing unheated fuel with said heated fuel prior to introduction into said combustor.

23. The combustion turbine system according to claim 3 wherein said combustion turbine system further comprises a heat

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recovery steam generator located downstream of said turbine with  
said combustion gas flowing therethrough, and with said portion  
of said fuel line being disposed in said heat recovery steam  
generator and in heat transfer relationship with said combustion  
gas.

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